BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C.

In the Matter of	)	
	)	
Telephone Number Portability	)	CC Docket No.
	)	95-116

REPLY COMMENTS OF
THE CELLULAR TELECOMMUNICATIONS INDUSTRY ASSOCIATION

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August 31, 1998

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The Cellular Telecommunications Industry Association

("CTIA")[1] respectfully submits its Reply Comments in the

above-captioned proceeding, specifically responding to

comments filed by the Telecommunications Resellers

Association ("TRA"). While TRA takes issue with the

wireless industry's decision to implement number

portability by separating the Mobile Identification Number

("MIN") from the Mobile Directory Number ("MDN"), TRA

concedes for the first time what CTIA and its members have

been telling the Commission throughout the pendancy of this

proceeding: that deployment of wireless number portability

will involve major expense, especially for smaller

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[1]   CTIA is the international organization of the wireless
communications industry for both wireless carriers and
manufacturers. Membership in the association covers all
Commercial Mobile Radio Service ("CMRS") providers,
including 48 of the 50 largest cellular and broadband
personal communications service ("PCS") providers. CTIA
represents more broadband PCS carriers and more cellular
carriers than any other trade association.

carriers, and will necessitate extension of the implementation dates set forth in Section 52.31 of the Commission's rules. TRA's comments reflect a basic misunderstanding of wireless networks and technology and are inconsistent with the Commission's requirement that CMRS carriers support nationwide roaming.[2] As such, TRA's recommendation that the Commission consider adopting a different approach for wireless number portability, i.e. location routing number ("LRN"), rather than the MIN/MDN separation approach that the industry is pursuing, will not support roaming and therefore does not satisfy the Commission's rules.

TRA's misunderstanding of this issue is underscored by the fact that the wireless industry's approach to number portability actually incorporates call routing based on an LRN methodology. LRN deals with the <u>routing</u> of calls in order to complete the call. Wireless carriers without query capable networks will make business arrangements to <u>complete</u> calls, but the arrangements are consistent with and support the LRN process.[3] The MIN/MDN separation deals

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[2]   47 CFR § 52.31(a)(2).

[3]   The LRN is a 10-digit (NANP-formatted) number assigned to a switch. Of these 10 digits, the first six (i.e. NPA-NXX) are significant for routing a call. A

primarily with the antecedent problem of mobile phone

signaling and registration once a subscriber has ported his

MDN.

Wireless number portability is more complicated than

its wireline counterpart because of mobility and because of

the mandate that wireless carriers provide nationwide

roaming for ported subscribers. The Wireless industry,

after much evaluation and extensive public process,

including a CTIA Request For Information, decided to

decouple the MIN/MDN in October of 1996.[4] The MIN/MDN

separation addresses aspects of wireless number portability

unique to the Wireless industry due to mobility. It simply

is not the case that the approach used for the Wireline

industry for local number portability is an appropriate

solution for wireless number portability in all aspects.

To the extent that the Wireless industry can use aspects of

the Wireline industry's solutions to number portability,

such as LRN, it does.

Number Portability Database ("NP DB") maps every ported
number to its serving switch's LRN. A query capable
network along the route would perform a query to the NP DB
to obtain the LRN associated with the called party's 10-
digit dialable number in order to correctly route the call.
See CTIA Report on Wireless Number Portability, Version
2.0, July 7, 1998 at 23.

[4]   CTIA Number Portability Forum Report, Oct. 9-11, 1996
at 2.

I.   BACKGROUND

The MDN is the dialable number that would be published in a telephone directory and which subscribers recognize as their wireless "telephone number." The MIN is the 10-digit number used to uniquely identify a mobile phone to its network. Since mobile phones are radios, the MIN is used to identify a particular phone with its carrier's network for purposes of originating and receiving calls, with the appropriate features and charges. "Without its own MIN, a cellular phone suffers an identity crisis."[5]

The MIN is important for other reasons as well. The MIN is used for all communication between the home system and a serving system when a customer is roaming, and between the serving system and the mobile phone. Most phones only "know" their MIN and most are only capable of supporting one field – in which the MIN and MDN are equal. When the directory number is dialed to call a wireless phone, the MDN is translated into the MIN by the home system.[6] Figuratively speaking, the MDN "belongs to" the subscriber, but the MIN "belongs to" the carrier and is important to the carrier's network functions.

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[5]   "Running Out of MINs," David Crowe, Wireless Review, June 1, 1998, p 74 (Attached).

When a wireless subscriber chooses to port his
dialable MDN, the MDN goes with the subscriber. The MIN,
however, stays with the carrier. When porting to another
wireless carrier, a subscriber needs a new MIN from his new
carrier to identify the phone to the new carrier's network.

It is this aspect of CMRS service that the TRA
proposal fails to comprehend. If the MIN and the MDN were
kept the same, i.e., not split, after a subscriber ports to
another wireless carrier, every time the mobile phone
transmitted its MIN to register in the new system, the
registration message would be sent to the old home system.
The original carrier would then have to either do a number
portability query or keep track of all its old subscribers
to reroute the message to the new carrier. Issuance of a
new MIN by the new carrier means that the subscriber's MIN
and [ported] MDN would be different.[7] This is the
separation of the MIN from the MDN.[8] As TRA recognizes, in

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[6]   Id.

[7]   Also, the original carrier would be able to reuse the
MIN. One subscriber will have a MIN that is the same as the
MDN of a subscriber in a different system – with no
resulting ambiguity. "Local Number Portability," David
Crowe, Cellular Business, April 1997, p 84 (Attached).

[8]   In other words, when the subscriber ports, the MDN and
t he MIN become separate and distinct: the ported
subscriber surrenders the MIN to the original carrier
(donor network) and receive a new MIN from the new carrier

order to accommodate the separation, the wireless industry, including carriers outside the top 100 MSAs must make changes at the switch level, to billing processes, and to back office operations.[9]

If the MIN were portable (along with the MDN), either a 10-digit Global Title Translation ("GTT") or a Number Portability Database ("NP DB") dip would be required in order to locate the home network of the subscriber <u>for every registration message from every serving network</u>.[10] Neither of these alternatives is desirable. A dip during registration would increase the query rate on the NP DBs, and not all WSPs are equipped to perform 10-digit GTT in the time frame required. The 10-digit GTT on registration would require provisioning all ported MDNs in all networks supporting roaming.[11]

(recipient network). The ported subscriber's MDN remains the same. The donor network can reuse the MIN for a new subscriber. <u>See</u> CTIA Report on Wireless Number Portability, Version 2.0, July 7, 1998 at 25.

[9] <u>Id.</u> TRA never suggests why, when confronted with the number portability mandate, the entire CMRS industry would voluntarily elect such a costly and inefficient approach if it was not the only approach that satisfies the FCC's rules.

[10] <u>See</u> CTIA Report on Wireless Number Portability, Version 2.0, July 7, 1998 at 25.

[11] <u>Id.</u>

II. SEPARATION OF THE MIN FROM THE MDN IS THE APPROPRIATE APPROACH TO WIRELESS NUMBER PORTABILITY

As indicated above, the MIN is used to identify a mobile phone to its network. The MIN/MDN separation enables a subscriber to port its MDN without sacrificing the integrity and usefulness of the MIN. This is because the original carrier may retain its MIN without the burden of having to do a number portability query or record keeping and routing calls to old subscribers who have changed to a new carrier. Thus, the separation cuts down on the amount of network signaling traffic that otherwise would be required.[12]

Another benefit to separating the MIN from the MDN is that area code splits and overlays will be easier to manage. Area code changes impact the MDN only, which can be changed in the switch, whereas changing a customer's MIN requires physically reprogramming the mobile phone for each and every area code change. Since the MDN and the MIN can now be different numbers, changing the MDN to accommodate area code relief does not necessitate changing the MIN with respect to area code changes.[13]

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[12]   "Taking Your MIN to the Max," David Crowe, <u>Cellular Business</u>, August 1997, p 52 (Attached).
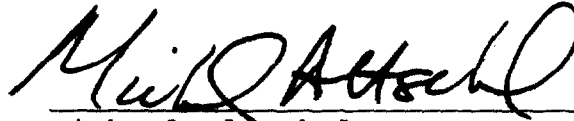
[13]   <u>Id.</u>

CONCLUSION

TRA's criticism reflects a basic misunderstanding of wireless technology. The TRA proposal simply will not permit the wireless industry to support nationwide roaming as required by the Commission's rules. However, TRA acknowledges that the solution the wireless industry has developed will require a complex, costly, and time-consuming implementation effort. It is for this reason that CTIA continues to seek forbearance of the CMRS number portability mandate. It confounds logic or reason that the entire industry would purposefully pursue a costly and inefficient solution in the face of a Commission mandate.

For these reasons, the Commission should reject TRA's

recommendation.

Respectfully submitted,

Michael Altschul
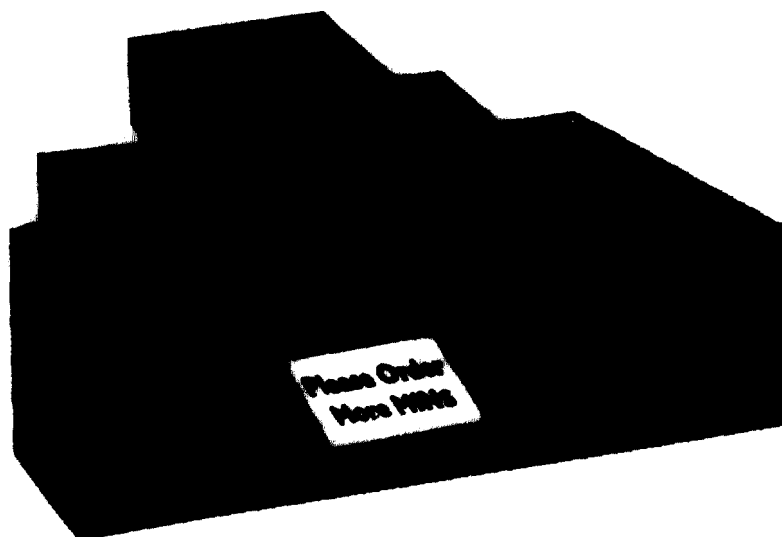Vice President and General Counsel

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■ PROTOCOLS

Running Out of MINs

BY DAVID CROWE

The only solutions for the MIN shortage seem to be on the distant horizon.

Withoutitsown MIN, a cellular phone suffers an identity crisis. This number identifies it uniquely to the network, allowing it to originate and receive calls with appropriate privileges and features and ensure that charges are billed to the right subscriber. The MIN identifier is used in wireless systems in many countries that use AMPS analog systems, IS-54 or IS-136 D-AMPS TDMA digital systems, or IS-95 CDMA digital systems. The only major wireless technology that does not use the MIN identifier is GSM.

With 10 billion possible MIN codes, it would seem that there would be enough for everyone. Yet, a shortage looms — not in North America but in all other countries that need this resource. The shortage of MIN codes is primarily due to an unnecessary restriction that was placed on them in the early days of cellular. In most phones, the MIN is programmed with the directory number. In fact, most people probably do not distinguish between the two, assuming that the number is simply the "phone number." However, the distinction between the MIN and the mobile directory number (MDN) is significant, although often overlooked.

The directory number is the number that is dialed when someone wants to call a wireless phone. This number is translated into the MIN by the home system, although this translation obviously has no effect when the MIN is the same number. The MIN, on the other hand, is never dialed (with the exception of some roamer port calls) but is used for all communication between the home system and the current serving system and between this system and the mobile over the radio interface. In most phones, only the MIN is known and, in fact, most serving systems also are aware of only the MIN.

International Perspective

It is not quite correct to say that North American directory numbers are used as the MIN — the country code ("1") is missing. This little omission is a big problem because if every other country programmed its phones in the same way, there would be no way to guarantee uniqueness. Mexico, for example, used to program all of its phones starting with the digits "52," but this came to a screeching halt when the area code "520" was allocated to Arizona.

International wireless carriers have recognized this problem for some time. Their solution is to allocate MIN codes that start with the digit 0 or 1, which
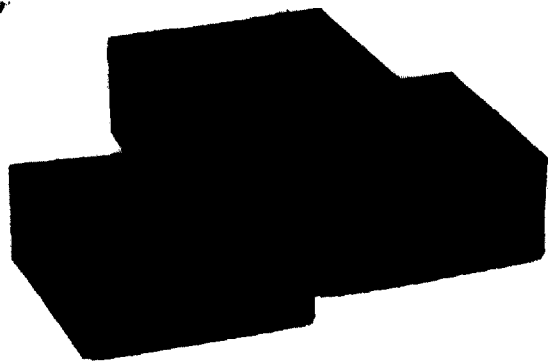
eliminates the possibility of conflict with MIN codes based on North American directory numbers. Mexico, for example, is reprogramming all cellular phones from a MIN starting with "52" to a MIN starting with "05." However, this solution will not guarantee uniqueness between two countries outside North America or with specialized North American-based systems that already use these non-dialable MINs.

Neutral Ground

The International Forum on AMPS Standards Technology (IFAST, www.ifast.org) has taken on the role of allocating what it has named international roaming MINs (IRMs.) This organization acts as a neutral party to allocate the resource in a first-come, first-served fashion. However, some companies already helped themselves to a large portion of this resource, reducing the number of free IRM blocks substantially.

The IRM is a 10-digit MIN beginning with the digit 0 or 1, with the first four digits allocated by IFAST to an individual wireless carrier. The remaining six digits are allocated by the carrier. This allows for 2,000 distinct blocks of 1 million MINs each.

Yet already, after only about a year of allocation by IFAST, almost half the available IRMs have been claimed. With about 100 countries using MIN-based technologies and with many countries having multiple wireless carriers that each require a separate IRM, the 1,000 remain-

ing blocks may not last long. Add to this the list of satellite carriers, data-over-cellular providers and specialized voice providers that also need the distinct MIN resource that the IRM provides.

The shortage of MINs is not due to wasteful allocation by IFAST; the majority of blocks were allocated by U.S. and Canadian companies before IFAST was created. Without an allocation authority, companies with special-purpose systems (mostly data) simply invented ways to use a previously 'unusable' resource, and organized the resource in the best way for their companies, without considering efficiency or coordination with other companies. The question now is how long IFAST

> With about 100 countries using MIN-based technologies and with many countries having multiple wireless carriers that each require a separate IRM, the 1,000 remaining blocks may not last long.

can continue to hand out IRM codes before the resource is exhausted.

Too Little, Too Late?

A lack of unique MINs could severely crimp the burgeoning interest in international roaming. Carriers that are denied a unique code will find it difficult or impossible to establish international roaming agreements.

A long-term solution to this problem is implementation of the international mobile station identity (IMSI) identifier. As the first word suggests, this code was designed with international roaming in mind. However, it will be several years before IMSI is widely implemented in phones, base stations, switches and net-

works. It is not even available in all standards at present, let alone commercial phones and infrastructure.

Another potential source of MIN codes is North America itself. By constraining the MIN to be a dialable directory number, the majority of MIN codes are implicitly allocated to wireline phone companies (or other telecommunications carriers that do not use the MIN concept, such as paging carriers).

Yet these wasted MIN blocks are not available for allocation because of the difficulty of developing and maintaining the huge database that would be necessary to separate the wheat from the chaff. Local number portability is going to force the industry to create this database to support the required separation of MIN and directory number.

Consequently, several billion MINs eventually will be freed from servitude. Theoretically, some of these could be used by international carriers, solving the MIN shortage problem. As with IMSI, however, this solution is some time away, and developing the systems and funding necessary to allocate MIN blocks worldwide would be yet another time-consuming step.

It is not just MINs that are suffering from exhaustion. Seemingly daily area code changes reflect the huge demand and inefficient allocation of directory numbers. The 1-800 resource has been exhausted, and the Internet is being forced to migrate to a new version of the TCP/IP protocol due to inefficient allocation of address numbers. Wireless carriers may be suffering, but at least they are not suffering alone. ■

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By David Crowe

Local Number Portability

Local number portability requires wireless carriers to support its capabilities and to implement the mandate in a similar time frame other recent mandates have requested.

Local number portability (LNP) allows anyone to keep his phone number when moving from one carrier to another in the same area. It will even work between technologies (for example, wireline to wireless, or cellular to PCS). LNP initially was designed to promote local phone competition, under the assumption that consumers would be reluctant to change carriers if they had to reprint business cards and other stationery and update their friends and colleagues with their new number.

LNP requirements have been extended to wireless by the FCC. The demand will not likely be as great because many wireless users do not give out their cellular phone numbers freely, and they usually do not have them listed in any directories. The restriction on LNP is that it is "local," so that a number may only be moved between carriers within the same local area. The area of interest for LNP is the metropolitan statistical area (MSA), which corresponds to cellular license boundaries, but not to PCS systems (which are based on MTA and BTA regions).

Wireline carriers will be using intelligent network capabilities to provide number portability, similar to the way 1-800 calls are handled. First, a potentially ported number has to be identified. This is not as easy for 1-800 calls, as any local number potentially could be ported. For each candidate number, a query has to be initiated to the local number portability SCP, which will return a local routing number if the number is ported. Following that query, the call can be routed using ISUP, with a flag set to indicate that number portability translation already has occurred. Without this indicator, some nasty infinite loops could occur.

The Cellular Telecommunications In-

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dustry Association (CTIA) has been encouraging study of the impact of LNP on wireless carriers through a Request For Information issued in August 1996 and a forum in October 1996. It recently issued its view of the requirements for standardization to the Telecommunications Industry Association (TIA) standards subcommittee TR-45.2.

WHAT'S A MIN GOT TO DO WITH IT?

One of the CTIA recommendations is to separate the MIN from the directory number. For most phones, the MIN and the directory number are the same number. This equality is not necessary. Breaking it will simplify the implementation of LNP for wireless carriers.

What is the difference between a MIN and a directory number? The MIN is the 10-digit number that is used to identify a mobile over the air interface in both directions. The directory number is simply that — the number that would be published in a telephone directory. Keeping these numbers the same has been a significant convenience for U.S. cellular carriers because obtaining and managing separate lists of MINs is not required. However, there are several reasons to break this connection. First, future area code changes will not require phone reprogramming of the MIN. Second, international roaming will be simplified. Finally, the implementation of LNP will be easier.

To see why the separation of MIN and directory number is so important, imagine that the MIN and directory number were kept the same after a customer went from

his original carrier to a competing carrier. Every time the cellular phone transmitted its MIN to register in a new system, the registration message would be sent to the old home system, which would then have to do either a number portability query, or keep track of all of its old subscribers to be able to reroute the message itself. If the MIN is reprogrammed to reflect the new home system, cellular phone-originated messages (mostly registrations and originations) can be routed directly to this system.

One of the consequences of this separation is that after a customer ports to a different system, his or her MIN could be reused. This will result in one customer having a MIN that is the same as the phone number of a customer in a different system, yet no ambiguity will result.

SS7 OR BUST

Another CTIA recommendation is to use SS7 ISUP for call setup, at least for local calls that might be ported. This is to accommodate a flag to indicate whether translation has yet occurred. This kind of change is easier to make in SS7, which is a structured computer-to-computer communications protocol.

Most cellular carriers today use MF-tone-based signaling. It does the job, but is restricted in capacity and flexibility. It would be possible to upgrade MF protocols to carry an equivalent LNP indicator, but this would require the cooperation of the landline carriers. The upgrade to SS7 may become a major cost issue for existing wireless carriers.

TOUGH DECISIONS FOR TIA

TIA is in the process of developing standards for LNP. It has to choose between three different protocols (or a mixture) as the basis for work: the IN protocol used for landline LNP queries, the IS-41 protocol used for wireless intersystem communications or the new wireless intelligent network protocol.

It also will have to consider the implications of the CTIA requirements at a deep technical level, which may uncover some unexpected problems, possibly requiring a mid-course correction. All of this will be performed under time pressure, although the TIA standards committees are getting used to this, with projects to support CALEA and E-9-1-1 well under way. I cannot speak for the next millenium, but the waning years of this millenium are going to be busy ones for wireless standards committees. ∎

NETWORKS

By David Crowe

Taking Your MIN to the Max

Number portability is going to force the entire cellular industry to separate MINs from MDNs.

In our youth, the difference between boys and girls for most of us was not that significant. Interesting, but not significant. But, only a few years later, it became of paramount importance. So it is with the mobile identification number (MIN), commonly, but erroneously, thought to be your cellular phone number (or "directory" number). In the single-digit years of the young cellular industry, the difference between the MIN and directory number was considered to be of only academic interest, similar to arguments over whether punctuation should go inside or outside of quotations marks. But, as cellular enters its teen years, the difference is becoming significant due to new realities: international roaming, vertical market segments, number portability and area-code changes.

Defining a mobile's "directory" number (or MDN, as I shall acronymize it) is easy. It is the number that would be in the phone book if cellular phone numbers were listed. It is the number that people dial to make your phone ring. The MIN is a 10-digit number used by the phone to identify itself to the system and used by the system to get the attention of a specific phone. At first, the relationship between the MIN and the MDN was simple — they were the same. Gradually that relationship has eroded, and over the next few years, it will crumble into dust.

The first international cellular systems had a challenge deciding how to program their MINs. Many of these countries have less than a 10-digit dialing plan, and so they had to fill some of the 10 MIN digits, often using their country codes. To give them more choices, there are two sets of defined country codes: the E.164 set that we are most familiar with when dialing overseas and a new E.212 set of "mobile" country codes (country codes for mobile phones, not codes for mobile countries). Mexico, for example, started by programming the first two digits of MINs with its E.164 country code, "52," and the remaining eight digits with its 8-digit national number. This worked well until the United States and Canada started to allocate area codes that started with 52. The first such area code, 520, was allocated to Arizona, near the Mexican border. Soon after this occurred, the Mexican government decided to move to a 9-digit numbering plan.

The problem for Mexican cellular carriers (many South American countries are experiencing similar problems) was that just as they were starting to develop international roaming, numbering changes were starting to make it impossible to distinguish their mobiles from mobiles from the United States and other countries. Mexican carriers were among the first to recognize that the MIN and MDN for a cellular phone did not need to be the same and have initiated a plan to reprogram all cellular phones in Mexico with MINs that start with the digits "05."

At the same time that many cellular systems were being built outside North America, some companies within the cellular heartland were starting to develop niche markets, requiring special MIN programming. Two examples are HighwayMaster, which provides cellular-based communications equipment to trucking companies, and Cantel, a nationwide carrier in Canada, which wanted to sell preprogrammed shrink-wrapped phones without committing directory numbers ahead of time. Both companies started to program phones with MINs that started with either the digit "0" or "1," and therefore could not conflict with a regular North American directory number (which only can start with the digits "2" through "9").

ARTIFICIAL RELATIONSHIP

These companies proved that the relationship between the MIN and the MDN was artificial, but because of the specific market niches, their solution was not seen as generally applicable. The new capability that is going to force the entire cellular industry to "bite the bullet" and separate MINs from MDNs, no matter how messy the operation, is number portability. The Cellular Telecommunications Industry Association has recommended that when a cellular phone number is ported, the directory number stays with the subscriber (as required by FCC mandate), but that the MIN stays with the carrier. Subscribers then will need new MINs from their new carriers. These MINs will identify the new carriers and will cut down the network signaling traffic that otherwise would be required.

> The new capability that is going to force the entire cellular industry to "bite the bullet" and separate MINs from MDNs, no matter how messy the operation, is number portability.

AREA-CODE CHANGES EASIER

One of the benefits that follows from separating the MIN from the directory number is that area-code changes will be easier to swallow. If several mobile subscribers are caught up in an area-code change, only the directory numbers need to change; their MINs can stay the same. The advantage is that the directory number can be changed in the switch while the MIN requires physical access to the mobile. Consequently, an area-code change can be effected without recalling any mobiles for reprogramming.

There is a downside to the separation of the MIN from the MDN. One problem is with the roamer port, the number that you can dial (usually XXX-ROAM) to

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reach a roamer known to be in a specific system. With the widespread availability of automatic call delivery, this older method may just fade away, although it can save double long-distance charges in some cases. Another annoyance will be that older cellular phones will display their MINs, but will not know their own directory numbers. After porting your phone number, when you dial RCL-# (or whatever code your cellular phone requires), you may be viewing someone else's phone number. Carriers have the expensive problem that some ancillary systems (for example, subscriber entry and billing systems) assume that the MIN and MDN are the same and must be redesigned to accommodate two different numbers.

Another important problem is management of MINs as a pool of numbers completely separate from directory numbers. Currently, management is simple; if you own a phone number, you own the corresponding MIN. This simple rule means that the majority of potential MINs are being hogged by wireline carriers that will simply never use them, a wasted resource of mammoth proportion.

The MIN management problem is not just limited to the United States and Canada. It is a global problem, as MINs must be unique around the world if international roaming is to work. Whichever organization is appointed to take on this role will have a big job on its hands. Just identifying all the MIN blocks currently used by cellular carriers around the world will be a cumbersome endeavor. However, the rewards are great because the MIN resource could, if not constrained, uniquely identify 10 billion different phones.

A small part of the MIN management mess is being solved by the fledgling International Forum on AMPS Standards Technology, which will be allocating all MINs that start with the digit "0" or "1" (whether in the United States or elsewhere). However, it has not touched the much bigger and more politically sensitive issue of the remaining 80% of the MIN pool that mirrors dialable numbers.

The MIN management problem also affects PCS systems that are based on the AMPS family of standards (IS-95 CDMA systems and IS-136 TDMA systems), which also use the MIN as an identifier. GSM-based PCS systems always have used the alternate International Mobile Station Identity (IMSI), which does not have the problems of the MIN identifier. The AMPS cellular and PCS industry is moving toward IMSI, but slowly, although the transition will be eased by the independence that a standalone MIN will bring.

The teen years are a difficult transition for most people, and the MIN issue shows that they aren't always easy for maturing industries either. Ironically, but not surprisingly, all of the problems that require separation of MIN and MDN resources have arisen from the spectacular growth of cellular since its birth. ∎